MARTIN MARIETTA ENERGY SYSTEMS, INC.

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November 1, 1985

Mr. H. Wayne Hibbitts
Office of Assistant Manager
for Safety and Environment
Department of Energy, Oak Ridge Operations
Post Office Box E
Oak Ridge, Tennessee 37831

Dear Mr. Hibbitts:

Blair Bridge Environmental Contamination Analyses Report

References:
(1) T. W. Oakes to Distribution, "June 14, 1985 Meeting with State of Tennessee Staff on Construction of Blair Bridge," June 19, 1985.
(2) H. W. Hibbitts to T. W. Oakes, "Cost of Sediment Sampling at Blair Bridge," July 1, 1985.
(3) T. W. Oakes to H. Wayne Hibbitts, "Industrial Hygiene Recommendations for Work at Blair Bridge," July 1, 1985.
(4) T. W. Oakes to Distribution, "Telephone Conversation Call on Blair Bridge," June 13, 1985.
(5) T. W. Oakes to T. A. Bowers, et al., "Meeting to Review Construction of Blair Bridge," June 13, 1985.
(6) Hoffman, F. O., et al., Preliminary Screening of Contaminants in Sediments, ORNL/TM-9370.
(7) T. W. Oakes to H. W. Hibbitts, "Blair Bridge Environmental Contamination Analyses - Cost," July 31, 1985.
(8) T. W. Oakes to H. W. Hibbitts, "Blair Bridge Environmental Contamination Analyses - Revised Cost," August 22, 1985.
(9) H. W. Hibbitts to T. W. Oakes, "Blair Bridge Environmental Contamination Analyses," October 9, 1985.

As authorized by Ref. (9), contaminant levels in the soils and sediments near the proposed Blair Road Bridge Construction Site have been completed. The attached report gives the detailed information on the results. A brief summary of this work is given below.

Summary of Contamination Analyses Results

- One floodplain soil core was collected on June 25, 1985.
- One creekbed sediment core was collected on June 25, 1985.
- Soil core was collected with a vibrocorer on the northwest bank about 15 meters from creek.
- Sediment core was collected in about 1.4 meters of water and about 5 meters from the vegetated creek bank.
- Each core was sectioned into 4 cm intervals.
- Each core interval was split in half and the two halves were packed into a 94 cm^3 aluminum can labeled A and B.

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- The A samples were analyzed for radionuclides.
- The B samples were analyzed for metals and organic materials.
- 42 samples were analyzed for Cs-137, Co-60, U-238, and K-40.
- 25 samples were analyzed for organic carbon and mercury.
- 10 samples were analyzed for extractable organic compounds.
- Analyses by ICP for other trace metals has not been completed.
- The highest concentrations for the soil samples were: organic carbon, 2.4%, 0-2 cm; mercury, 8.1 µg/g, 2-6 cm; Cs-137, 0.99 pCi/g, 2-6 cm; U-238, 8.8 pCi/g, 30-34 cm; and K-40, 19.1 pCi/g, 0-2 cm.
- The highest concentrations for the sediment samples were: organic carbon, 2.5%, 4-8 cm; mercury, 460 µg/g, 80-84 cm; Cs-137, 4.6 pCi/g, 92-96 cm; U-238, 29.8 pCi/g, 72-76 cm, and K-40, 14.3 pCi/g.
- The highest extractable organic compound found was anthracene, 0.26 µg/g at 0-2 cm from the soil core.
- From the data, the top 0.5 meters of sediments are relatively uncontaminated.
- The highest concentration levels are below this 0.5 meter depth. These are U-238 at 72-76 cm, Cs-137 at 92-96 cm, and mercury at 80-88 cm.

Based on this data and the use of standard industrial hygiene requirements, no industrial hygiene problems are anticipated. If sediment below the 0.5 meter level needs to be removed, we recommend that an assessment of the overall activities be completed before the removal is approved. If you have questions on the results in the report, please contact C. R. Olsen, ORNL-ESD, at 576-0505. If you need additional information or help on the assessment, please contact me at 576-8499. A total of $9,780 will be charged to account number 2230-0000.(9) Other information on the project is contained in Refs. 1-8.

Sincerely,

Tom W. Oakes

T. W. Oakes, Coordinator of
Environment and Health Physics
Environment, Safety, and Health

TWO:jct
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CONTAMINANT LEVELS IN THE SOILS AND SEDIMENTS NEAR THE PROPOSED BLAIR ROAD BRIDGE CONSTRUCTION SITE

C. R. Olsen and N. H. Cutshall
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Date of Issue: October 28, 1985

CONTAMINANT LEVELS IN THE SOILS AND SEDIMENTS NEAR THE PROPOSED BLAIR ROAD BRIDGE CONSTRUCTION SITE

C. R. Olsen and N. H. Cutshall
Environmental Sciences Division

One floodplain soil core and one creekbed sediment core were collected on June 25, 1985, at the proposed construction site for the new Blair Road Bridge. The soil core (BBridge) was obtained with a vibrocorer on the northwest bank (about 15 meters from creek) at the location for the proposed bridge piling (Figure 1). The sediment core (RBB) was collected in about 1.4 meters of water, and about 5 meters from the vegetated creek bank (Figure 1).

The cores were sectioned into 4 cm intervals. Each interval was split in half and the two halves were packed into a 94 cm^3 aluminum cans, labeled A and B. The A samples were analyzed for radionuclides by our laboratory, and the B samples were submitted to Wayne McMahon (Analytical Chemistry Division, K-25) for the metal and organic analyses.

A total of 42 samples have been gamma counted for Cs-137, Co-60, U-238 and naturally occurring K-40. On the basis of the vertical distribution of Cs-137, we submitted a total of 25 samples (from the B collection) for organic carbon and mercury analyses. These 25 samples were also suppose to be analyzed for several other trace metals (including Pb, Cr, Ni, Cu, Zn, etc.) by ICP. In addition, a total of 10 samples were analyzed for extractable organic compounds (such as PCBs, pyrene, anthracene, etc) by GCMS.

The analytical results concerning the concentrations of radiocesium, uranium-238, and mercury in the soil and sediment cores are presented in Tables 1 and 2, respectively. Data concerning the concentration of organic carbon and the concentration of a naturally occurring radionuclide (K-40) are also presented in Tables 1 and 2 to help document the extent of contamination and interpret the vertical profiles. At the present time, the samples have not been analyzed for other trace metal contaminants by ICP (McMahon, personal communication). A summary of the analytical results for extractable organic compounds are presented in Table 3.

SEDIMENT AND SOIL SAMPLE COLLECTION DATE JUNE 25, 1985

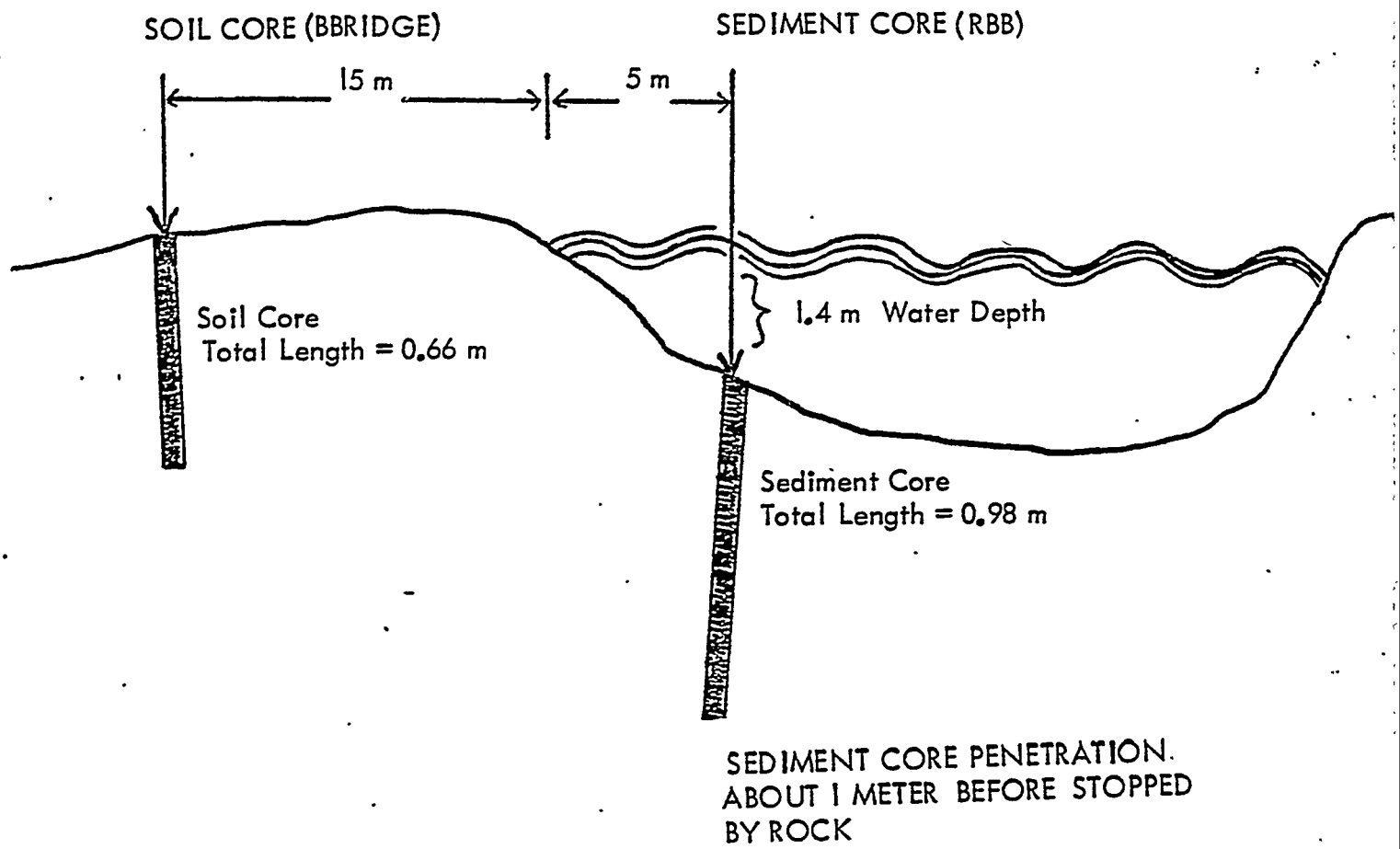

Figure 1. Soil and Sediment Sampling Locations Near the Proposed Blair Road Bridge Construction Site

TABLE 1

BLAIR ROAD BRIDGE SOIL NEAR PROPOSED PILING

SAMPLE (cm)	ORG CARBON (%)	MERCURY (µg/g)	Cs-137 (pCi/g)	U-238 (pCi/g)	K-40 (pCi/g)
0-2	2.4	6.5	0.96 ± 0.03	5.9 ± 1.6	19.1 ± 0.4
2-6	2.1	8.1	0.99 ± 0.06	≤2.8	17.6 ± 0.6
6-10	1.7	6.3	0.67 ± 0.06	≤2.8	18.8 ± 1.2
10-14	1.3	2.7	0.36 ± 0.05	≤2.8	17.3 ± 1.0
14-18	1.3	2.7	0.34 ± 0.05	≤2.8	16.5 ± 1.1
18-22	1.2	2.1	≤0.1	≤2.8	17.9 ± 1.1
22-26	1.5	≤1.0	0.07 ± 0.01	≤2.8	16.5 ± 0.4
26-30	-	-	≤0.1	≤2.8	15.3 ± 0.8
30-34	0.8	≤1.0	≤0.1	8.8 ± 3.1	16.9 ± 1.1
34-38	1.0	2.1	0.10 ± 0.03	≤2.8	17.0 ± 0.8
38-42	0.6	≤1.0	≤0.1	≤2.8	16.0 ± 0.7
42-46	-	-	≤0.1	≤2.8	15.4 ± 0.7
46-50	-	-	≤0.1	≤2.8	16.2 ± 0.9
50-54	-	-	≤0.1	≤2.8	15.0 ± 0.9
54-58	-	-	≤0.1	≤2.8	15.9 ± 0.7
58-62	-	-	≤0.1	≤2.8	14.8 ± 0.9
62-66	0.4	≤1.0	≤0.1	2.0 ± 0.6	15.0 ± 0.2

TABLE 2

POPLAR CREEK SEDIMENT NEAR BLAIR ROAD BRIDGE

SAMPLE (cm)	ORG CARBON (%)	MERCURY (µg/g)	Cs-137 (pCi/g)	U-238 (pCi/g)	K-40 (pCi/g)
0-2	1.5	6.3	1.11 ± 0.03	≤2.8	13.0 ± 0.4
2-4	2.4	4.2	1.26 ± 0.03	≤2.8	12.0 ± 0.4
4-8	2.5	2.2	1.07 ± 0.02	3.0 ± 1.1	9.9 ± 0.3
8-12	1.7	5.6	0.33 ± 0.02	≤2.8	13.8 ± 0.3
12-16	1.6	6.8	0.23 ± 0.01	3.5 ± 0.9	12.9 ± 0.3
16-20	-	-	0.18 ± 0.02	≤2.8	10.3 ± 0.3
20-24	-	-	0.30 ± 0.04	≤2.8	8.9 ± 0.9
24-28	-	-	0.34 ± 0.04	4.1 ± 2.3	14.3 ± 0.8
28-32	-	-	0.38 ± 0.05	≤2.8	14.1 ± 1.1
32-36	1.3	14.0	0.79 ± 0.06	≤2.8	11.5 ± 1.0
36-40	1.3	22.6	2.63 ± 0.11	≤2.8	11.8 ± 1.0
40-44	-	-	1.33 ± 0.08	≤2.8	11.0 ± 1.0
44-48	-	-	0.68 ± 0.05	8.3 ± 2.6	10.3 ± 0.6
48-52	1.6	18.0	0.90 ± 0.07	≤2.8	11.6 ± 0.9
52-56	-	-	1.33 ± 0.08	12.2 ± 4.0	11.4 ± 0.9
56-60	-	-	1.10 ± 0.08	≤2.8	14.8 ± 1.1
60-64	1.4	38.3	0.82 ± 0.04	7.5 ± 2.5	11.5 ± 0.6
64-68	0.7	54.4	1.33 ± 0.08	10.2 ± 2.9	11.1 ± 0.9
68-72	-	-	0.87 ± 0.07	4.3 ± 5.9	13.1 ± 1.0
72-76	-	-	1.08 ± 0.08	29.8 ± 5.3	12.3 ± 1.0
76-80	-	-	1.01 ± 0.06	15.5 ± 2.5	10.0 ± 0.7
80-84	1.1	460.0	1.06 ± 0.07	8.8 ± 3.2	9.2 ± 0.8
84-88	1.1	220.0	1.53 ± 0.08	8.0 ± 3.4	10.5 ± 0.9
88-92	0.9	40.0	1.71 ± 0.08	3.8 ± 2.2	9.9 ± 0.7
92-96	1.0	56.0	4.64 ± 0.13	7.4 ± 3.1	9.7 ± 0.8
96-98	-	-	2.81 ± 0.11	≤2.8	7.6 ± 0.7

TABLE 3

EXTRACTABLE ORGANIC COMPOUNDS IN THE SOILS AND SEDIMENTS

SAMPLE	ORGANICS (µg/g)						
	3B	4B	18B	31B	42B	44B	45B
SOIL							
0-2	0.26	≤0.024	≤0.009	≤0.006	0.11	0.22	0.22
2-6	≤0.002	0.03	≤0.003	≤0.002	≤0.002	0.11	0.05
6-10	0.25	0.07	0.06	0.37	≤0.002	0.24	0.09
22-26	≤0.002	≤0.008	≤0.003	≤0.002	≤0.002	≤0.005	≤0.002
62-66	≤0.002	≤0.008	≤0.003	≤0.002	≤0.002	≤0.005	≤0.002
SEDIMENT							
0-2	≤0.002	≤0.008	≤0.003	≤0.002	≤0.002	0.12	0.09
4-8	≤0.002	≤0.008	≤0.003	≤0.002	≤0.002	0.12	0.05
32-36	≤0.002	≤0.008	≤0.003	≤0.002	≤0.002	≤0.005	≤0.002
64-68	≤0.002	≤0.008	≤0.003	≤0.002	≤0.002	≤0.005	≤0.002
92-96	≤0.002	≤0.008	≤0.003	≤0.002	≤0.002	≤0.005	0.09

ORGANIC COMPOUND CODES

3B -- Anthracene
4B -- Benzo(a)Anthracene
18B-- Chrysene
31B-- Fluoranthene
42B-- Naphthalene
44B-- Phenanthrene
45B-- Pyrene

The results in Table 1 indicate that the floodplain soils in the vicinity of the proposed new Blair Road Bridge contain only small amounts of radionuclides and mercury in the top 25 cm (10 inches) of the soil surface. The small increase in Hg and Cs-37 concentration at 34-38 cm may reflect, (1) surface soil leaching and contaminant migration, (2) lateral migration from the creek at the unsaturated-saturated boundary, or (3) biological uptake and cycling, but the contaminant levels are very near our detection limit, and therefore any explanation is purely speculative. Polychlorinated biphenyls (PCBs) were undetectable (≤0.1 ug/g) in all the soil samples and consequently the data have not been presented. Concentrations of several extractable organic compounds which may be natuaral organic degradation products as well as contaminants are listed in Table 3 and appear to show a peak at the 6 to 10 cm depth interval.

The vertical distributions of radiocesium, U-238 and Hg in the Poplar Creek sediment core are illustrated in Figure 2. It is apparent from this figure (and the data in Table 2), that the top 0.5 meter (1.5 feet) the of streambed sediments at this site, are relatively uncontaminated, but that contaminant concentrations in the sediments below 0.5 meter increase dramatically. The maximum U-238 concentration (30 pCi/g) occurs at a sediment depth between 72-76 cm, and the maximum radiocesium concentration (4.6 pCi/g) occurs near the core bottom at 92-96 cm. These maximum concentrations are similar to concentrations of naturally occurring K-40 (10-15 pCi/g).

High levels of mercury were measured between 80 and 88 cm. Since the samples for Hg analysis were submitted before the U-238 analyses were complete, we do not have data concerning the concentration of Hg at the 72-76 cm depth increment where the concentration of U-238 peaks. Previous work in East Fork Poplar Creek have shown that vertical profiles of U-238 and Hg may be correlated (Ashwood et al., 1985). Consequently, it is possible that Hg levels in the sediments between 72 and 76 cm may actually be higher than the levels measured between 80 and 88 cm. Concentrations of PCBs and other extractable organic compounds (except pyrene) were below detection limits in the stream sediments (Table 3).

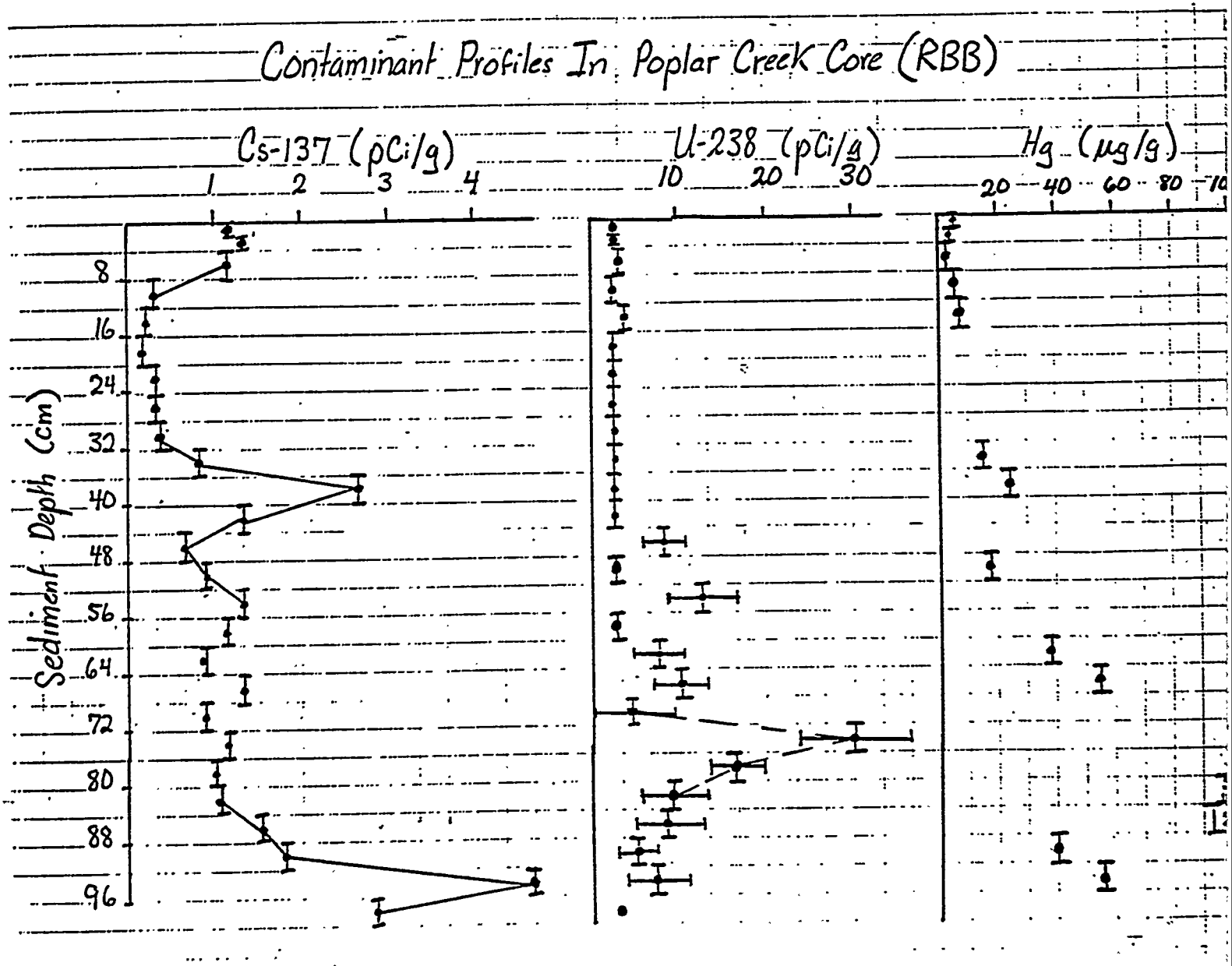

Figure 2. Vertical Distributions of Radiocesium, U-238 and Mercury in the Stream Sediments Near the Proposed Site for the new Blair Road Bridge

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KEYWORDS:

metals
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mercury

ABSTRACT:

Results of soil and sediment sampling at the proposed construction site for new Blair Road Bridge. Sediment samples were collected in Poplar Creek.

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Areas of Interest

K	K-25 (ORGDP) Site
X	X-10 Site / ORNL
Y	Y-12 Site
S	S-50 Site (Thermal Diffusion Plant)
ORR	The Oak Ridge Reservation
MELT	The Melton Hill Reservoir (Clinch from Solway bridge to Melton Hill Dam)
CLIN	The Clinch River from Melton Hill Dam to the confluence with the TN River
WOC	White Oak Creek
WOL	White Oak Lake (White Oak Creek above White Oak Dam)
POPL	Poplar Creek (above the confluence with the East Fork)
EFPC	East Fork Poplar Creek
PCE	Poplar Creek Embayment (Poplar Cr. below the confluence of the East Fork)
BEAR	Bear Creek
WATT	Watts Bar Reservoir (the TN River from the confluence of the Clinch to Watts Bar Dam)

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